## COGS 1: Winter 2020

### Section A, Week 2

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<th>Name</th>
<th>Email</th>
<th>Days</th>
<th>Time</th>
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<tbody>
<tr>
<td>Professor Boyle</td>
<td><a href="mailto:mboyle@ucsd.edu">mboyle@ucsd.edu</a></td>
<td>Friday</td>
<td>2-4 pm</td>
<td>CSB 130</td>
</tr>
<tr>
<td>Tiffany</td>
<td><a href="mailto:tchokry@ucsd.edu">tchokry@ucsd.edu</a></td>
<td>Tuesday</td>
<td>12-1 pm</td>
<td>CSB 114</td>
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<tr>
<td>Bora</td>
<td><a href="mailto:bmutluog@ucsd.edu">bmutluog@ucsd.edu</a></td>
<td>Wednesday</td>
<td>4-5 pm</td>
<td>PC Jamba Juice</td>
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<tr>
<td>Jonathan</td>
<td><a href="mailto:jahern@ucsd.edu">jahern@ucsd.edu</a></td>
<td>Tuesday</td>
<td>2-3pm</td>
<td>CSB 114</td>
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<tr>
<td>Bryan</td>
<td><a href="mailto:blt010@ucsd.edu">blt010@ucsd.edu</a></td>
<td>Thursday</td>
<td>1-2pm</td>
<td>Sequoyah 142</td>
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<tr>
<td>Corey</td>
<td><a href="mailto:yiz329@ucsd.edu">yiz329@ucsd.edu</a></td>
<td>Wednesday</td>
<td>1-2pm</td>
<td>CSB 231</td>
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<tr>
<td>Meri</td>
<td><a href="mailto:myedigar@ucsd.edu">myedigar@ucsd.edu</a></td>
<td>Tuesday</td>
<td>12:30 - 1:30 pm</td>
<td>PC 4th Floor</td>
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<tr>
<td>Ilmaa</td>
<td><a href="mailto:ilhaque@ucsd.edu">ilhaque@ucsd.edu</a></td>
<td>Tuesday</td>
<td>2-3:30pm</td>
<td>PC Theatre</td>
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<tr>
<td>Ana</td>
<td><a href="mailto:achkhaid@ucsd.edu">achkhaid@ucsd.edu</a></td>
<td>Wednesday</td>
<td>12-1pm</td>
<td>CSB 215</td>
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Important Information

• Quizzes
  ○ Graded quizzes at the end of every section (~15mins)
  ○ Lowest quiz score will be dropped

• Midterms
  ○ Multiple choice and short answer
  ○ Midterm 1: scheduled for Tuesday week 5
  ○ Midterm 2: scheduled for Tuesday week 8
  ○ Midterm 3: scheduled for Thursday week 10

• Extra Credit
  ○ EC quizzes on readings on TritonEd (Start Week 3)
  ○ SONA - up to 4 EC units (4 units = 1% final grade)
Important Information (contd.)

- **Section Procedure**
  - I will present the list of review questions we can discuss. Because we might not have time to go over everything, we will take a vote to decide which material you want to go over the most. (~35mins)

- **Piazza**
  - [https://piazza.com/ucsd/winter2020/cogs1](https://piazza.com/ucsd/winter2020/cogs1)
  - Ask questions (& answer others’ questions)
  - Please make sure your questions are public (unless they are about a private matter)
  - Please make sure your questions haven’t been answered before
A note about the quizzes:

Issues:
- Extra marks around bubbles
- No bubbling
- Bubbling too light
- No name
Write and circle in your PID

Write down your name here

Bubble in the current section

Sign and date here

Bubble in the answers
Please do not do this!!
This person did not bubble in the quiz!

Score for quiz will be: 0
This quiz is bubbled in TOO LIGHT!

The accuracy of grading this quiz is LOW!
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<tr>
<th>Last NAME, First NAME</th>
<th>Section you are taking this quiz:</th>
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<td>Dr. Mary ET Boyle</td>
<td>[1] ○ Monday @ 3 Zoe</td>
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<td>Quiz A</td>
<td>[2] ● Monday @ 4 Lauren</td>
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<td>[3] ○ Monday @ 5 Alexis</td>
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<td>[4] ○ Monday @ 6 Kenny</td>
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<td>[5] ○ Friday @ 9 Sandhya</td>
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<td>[6] ○ Friday @ 10 Amy</td>
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No name = ACADEMIC INTEGRITY VIOLATION!
No name = 0 for quiz score
Last Week’s Topics

- Lecture 1 | Dr. Boyle: An Introduction to Cognitive Science
- Lecture 2 | Dr. Boyle: Sleep and Circadian Rhythm
Lecture 1

An Introduction to Cognitive Science,

Dr. Boyle
Lecture 1 | Review Questions

1. **What is Cognitive Science** –
   a. What are the main objectives of the field?
   b. How are the disciplines related?

2. How do Pinker and Elman differ in terms of innate language?

3. The early philosophers thought about the mind and contributed greatly to psychology; what are some of the tools used by cognitive scientists today to understand how the mind relates to the brain?

4. How does computer science, neuroscience, philosophy, psychology and linguistics contribute to cognitive science?

5. What are the theoretical and applied aims of cognitive science?
1a. What is Cognitive Science, and what are the main objectives of the field?

- Cognitive science is the **interdisciplinary scientific study** of the mind and its processes (e.g. emotion, language, reasoning, memory, perception)

- Cognitive science investigates **how information is represented and transformed** in terms of behaviour and thought.
1b. CogSci subdisciplines & how they are related

- Neuroscience
- Philosophy
- Computer science
- Linguistics

Defines key questions:
- What is reasoning, meaning?
- How does neural activity represent, store information and how does it translate to behavior?
- How is meaning/information represented and conveyed?

All Ques.
2. Language: Pinker vs. Elman?

Still in argument! Some main positions:

- Language is the way it is because of an innate ability - the language instinct (**Nature**)
- Language is the way it is due to the general properties of human cognition (**Nurture**)

All Ques.
3. “Reading Minds” | Brain Computer Interface

- Field of research that uses **sensors** to decode electrical activity of the brain, which the **computer** decodes in order to control an external/implanted device.

- Example: Treatment of Parkinson’s Disease

  [link](https://www.ucsd.tv/search-details.aspx?showID=21054)
4. How does computer science, neuroscience, philosophy, psychology and linguistics contribute to cognitive science?
5. Theoretical and Applied Aims of Cognitive Science

Aims of Cognitive Science

Theoretical: Explain how thinking works

Applied: Robotics, Education, Design, Mental Illness, etc.
Lecture 2
Sleep and Circadian Rhythm,
Dr. Boyle
Lecture 2 | Review Questions (1 of 4)

1. What are the consequences of sleep deprivation?
2. What is the role of melatonin and light in regulating circadian rhythms?
3. What is the suprachiasmatic nucleus (SCN)? Where is it located? What does it do?
4. What is a circadian rhythm?
   a. What does it do?
   b. What will happen when this rhythm is disrupted?
5. What are the other internal clock systems that we’ve talked about in the class?
6. How is blood sugar regulated in our body?
7. Every cell has its own clock, for example, skin cell.
   a. What is the clock of skin cells?
   b. What does this tell us about the importance of circadian rhythms?
8. What factors are associated with our ability to go to sleep?
9. What is “social jet lag”?
10. What is so important about blue light?
11. What are the effects of chronic sleep deprivation? (REM sleep behavior disorder, sleep apnea, etc.)
12. What is sleep inertia?
13. What is the cognitive and physical performance of someone who has not slept in a 24 hour period?
14. What is sleep hygiene? Compare the effects of good and bad sleep hygiene. What are the components of good sleep hygiene?
15. Can sleeping aids overcome the effects of poor sleep hygiene? Why? Why not?
16. Why are light and food considered to be zeitgebers?
17. What is insulin? When working properly, does insulin increase or decrease blood glucose levels?

18. What is glucagon? When working properly, does glucagon increase or decrease blood glucose levels?

19. Do bacteria display a circadian rhythm?
1. What are the consequences of sleep deprivation?

**Short term** sleep deprivation leads to:
- Cognitive and behavioral changes
- Decreased ability to concentrate
- Decreased short-term memory
- Paranoia and hallucinations

**Long term** sleep deprivation leads to:
- Cardiovascular stress (elevated heart rate and blood pressure)
- Disruption of the glymphatic system and thus build up of toxins
- Impaired executive functions
- Impaired emotional responses
- Impaired decision making
What are the consequences of sleep extension?

- Stanford Basketball Study
  - Investigate effects of sleep extension over multiple weeks on specific measures of athletic performance as well as reaction time, mood, and daytime sleepiness
    - For 6 weeks, minimum of 10 hrs sleep/night
  - Results:
    - More accurate shooting
    - Faster reaction time
    - Increased mental health
    - Increased physical well-being
2. What are the roles of melatonin and light in regulating circadian rhythms?

Sleep wake cycle is regulated by the circadian system.
3. What is the SCN? What does it do?

- The **suprachiasmatic nucleus (SCN)** is the tiny region of the brain in the *hypothalamus*.
  - The “master clock” of the brain used to **coordinate and synchronize** most of the body clocks in the periphery.
4. What is a circadian rhythm? What does it do? What will happen when this rhythm is disrupted?

- Internal process that regulates the sleep-wake cycle
- One oscillation of circadian rhythm is on avg. **24 hours.**
- The brain synchronizes clocks in various cells of the body.
  - Genes direct the production of proteins at different times of day, which ramp up or inhibit biological processes.

**If the sleep wake cycle is disrupted** it can cause **metabolic dysregulation**
- Metabolic disruption
- Obesity
- Impaired immunity
- Cognitive malfunction
5. What are the other internal clock systems that we’ve talked about in the class?

- Pancreas
- Skin Cells
6. How is blood sugar regulated in our body?

**Insulin** stimulates the liver to remove glucose from the blood and stores it as glycogen.

Beta cells release **INSULIN**.

Tissues take up glucose from blood.

High blood glucose.

Lowers glucose levels in blood.

*Figure adapted from Kaidanovich-Bellin, O. et al 2012.*
6. How is blood sugar regulated in our body? (contd.)

Glucagon stimulates the conversion of stored glycogen in the liver into glucose. Increases glucose levels in blood.

Alpha cells release GLUCAGON.

low blood glucose
7. Every cell has its own clock, for example, skin cell. What is the clock of skin cells?
8. What factors are associated with our ability to go to sleep?

- Previous activities such as food and alcohol consumption
- Genetic components
- Environmental lights
  - Photoreceptors regulate our circadian rhythms
  - Blue light delays melatonin release
- The time we go to sleep
9. What is a “social jet lag”?

● Social jet lag is a result of circadian disruption
  ○ Exacerbated by drastic difference in wake times throughout the week
● Effects of circadian disruption on students
  ○ Affected executive function and emotional responses, decision making, mental health, and may be linked to rise of ADHD diagnoses
  ○ Schools with healthier start times saw increases in attendance, test scores, GPAs, and health
10. What is so important about blue light?

- Short-wavelength light AKA blue light is interpreted by our circadian systems as daylight.
- Blue light is emitted by televisions, computers, phones, etc.
  - Postpones the signal to brain to go to sleep
  - Subsequently affects the release of melatonin
11. What are the effects of chronic sleep deprivation? (REM sleep behavior disorder, sleep apnea, etc.)

REM-sleep behavior disorder

- Paralysis during REM sleep does not occur → dreams are acted out
- Increased risk for neurodegenerative diseases

Sleep apnea

- Breathing pauses for seconds to minutes during sleep → body briefly jolts to continue breathing
- Cognitive impairments
- Increased risk for diabetes, cardiovascular diseases
12. What is sleep inertia?

- Sleep inertia refers to a general feeling of grogginess immediately after sleep
  - Can be prevented by good sleep hygiene
  - Typically dissipates quickly when fully rested, but can last throughout day when without sleep
13. What is the cognitive and physical performance of someone who has not slept in a 24 hour period?

- The physical performance someone who has not slept in 24 hours is similar to that of someone with a BAC of 0.1%.

- **Short term effects:**
  - Decreased perception and motor skills
  - Emotional control
  - Learning, memory, simple arithmetic and reasoning tasks

- **Long term effects:**
  - More prone to metabolic and endocrine problems
  - Increased risk of diabetes
  - Decreased immune function
  - Increased risk of cancer
  - Increased risk of dementia
14. What is sleep hygiene?

Five things that stop a good night’s sleep

http://www.bbc.co.uk/science/0/20427553
15. Can sleeping aids overcome the effects of poor sleep hygiene?

- Existing sleeping aids may not be enough to counteract effects of overstimulation
- Sleep from medicine may not be as effective as regular sleep
- Risk of *parasomnias* -- behaviors like eating/leaving the house while asleep with no memory of it
16. Light and food as Zeitgeber

**Zeitgeber** is a cue that regulates the body’s circadian rhythms

*When there’s Light outside,* it gives your brain a cue that it’s day time

*When you consume Food,* it gives your gut, pancreas and liver a cue that it’s day time

SCN is not the only clock in the body
17. What is insulin? When working properly, does insulin increase or decrease blood glucose levels?
18. What is glucagon? When working properly, does glucagon increase or decrease blood glucose levels?

Glucagon stimulates the conversion of stored glycogen in the liver into glucose.

Increases glucose levels in blood

Alpha cells release GLUCAGON

Low blood glucose
19. Do bacteria display a circadian rhythm?

- Yes!
- Simple phototrophic bacteria harvest energy during the day and repairs DNA at night

There’s a specific time for everything!
Quiz Time!

• No talking, signaling, or communicating of any kind.
• Put away your books, notes, computers, phones, etc.
• Pen or pencil is okay (just make sure it’s a black pen and you press hard with a pencil).
• Write your name in the “Name” box, write and circle in your PID, and sign the academic integrity agreement.
• Bubble in this section
• Please have your student ID out when you turn in your quiz!
Write and circle in your PID

Write down your name here

Sign and date here

Bubble in the current section

Bubble in the answers

**ACADEMIC INTEGRITY**

By taking this quiz, you agree that you will follow ALL UCSD ACADEMIC INTEGRITY policies. It is YOUR responsibility to know and understand all of the policies. Failure to follow all UCSD Academic Integrity policies could result in expulsion from UCSD.

DO NOT DISCUSS THIS QUIZ CONTENTS WITH FELLOW STUDENTS!!!

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